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# DOCUMENTATION OF AERIAL SURVEY SIGHTING AND TRANSECT FORMS FOR THE 1977 AND 1979 EASTERN TROPICAL PACIFIC CETACEAN SURVEYS

by

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In 1977[1] and 1979[2], the National Marine Fisheries Service (NMFS) Southwest Fisheries Center completed research projects to assess the status of porpoise populations in the eastern tropical Pacific Ocean. Each project utilized two NOAA research vessels and contracted long range surveillance aircraft to provide coverage of the offshore and inshore areas, respectively. This report briefly explains the data forms and coding formats used on the aerial phase of the surveys. Aerial surveys in both years used the same Transect (effort) Record (Figure 1) and Marine Mammal Sighting Record (Figure 2) forms designed for line transect theory analyses. Although the same forms were used for both surveys, criteria used to record some data elements differed slightly between years and are indicated in the accompanying coding formats (Tables 1-2). These forms have proven useful and will be used in future NMFS marine mammal surveys.

Aerial Survey Transect Records (Figure 1 and Table 1) were used to record geographical positions and time for a single unit of searching effort where all sighting conditions remained constant throughout a defined period of time. This period, recorded as a leg, continued as long as altitude (within 50 feet), ground speed, observer positions, sea state, sun position, and visibility were constant. If any of these characteristics changed, a new leg began with the updated conditions recorded. This procedure for recording units of searching effort was maintained during a flight with the following exceptions:

---

[1]Aerial Survey Trip Report, January-June 1977, October 1977, Southwest Fisheries Center Admin. Report No. LJ-78-01, Southwest Fisheries Center, La Jolla, California, 73 pp.

[2]Trip report: Porpoise population aerial survey of the eastern tropical Pacific Ocean, January 22-April 25, 1979, 1980, Terry D. Jackson, Southwest Fisheries Center Admin. Report No. LJ-80-1, Southwest Fisheries Center, La Jolla, California, 74 pp.

1. Transect record forms were used only during actual searching effort. Periods of time when the aircraft was enroute to areas of interest were not recorded as effort.

2. To reduce observer fatigue, observers were rotated among various duty stations at regular intervals (60 minutes in 1977; 45 minutes in 1979). If rotation could be accomplished with continuous observation, the legs were continuous.

3. Units of effort (Legs), were generally continuous during a flight. However, if any of the factors affecting sightability exceeded predetermined levels, the period of time involved was not recorded as effort.

4. When a sighting was made during a leg, and the aircraft diverted momentarily to investigate, the unit of continuous effort was maintained as a leg. The data elements "reason for position" and "searching" were used within a leg to indicate the temporary suspension of searching effort.

Thus, significant factors affecting sightability were recorded in continuous units of effort suspended only temporarily if the aircraft diverted from the trackline to investigate a sighting.

The Aerial Survey Sighting Record (Figure 2 and Table 2) were used to code information concerning environmental conditions, geographic location, time, perpendicular distance, estimates of school size, species composition, photographs taken, etc., at the time of a cetacean observation. There were three categories of sightings recorded during the surveys. The majority of sightings occurred during searching effort while the aircraft was in a "search mode." These sightings were referenced to the Transect Record by a sequential sighting number assigned by the recorder at the time of sighting, as well as by date, time, flight number and leg number. The second category of sightings were those made during a leg of effort but while the aircraft was temporarily diverted from a "searching mode" (usually to investigate another sighting). These sightings are referenced to the Transect Record as the former sightings. The third category reflects sightings made opportunistically while the aircraft was not in a "searching mode." These sightings are referenced to the Transect Record data by date, time and flight number.

Procedures[1,2] were similar on both surveys. Each observer rotated through a number of duty stations (bow, left and right observer, recorder, rest). In the recorder position, the observer had access to a Global Navigational System (GNS) remote display unit capable of supplying the necessary navigational and location information. All other information was furnished by the pilots or observers via the Internal Communication System (ICS). Each observer kept a personal 'Sighting Log' to record important details of a particular sighting and his school size estimates. In 1977 these estimates were passed to the recorder after each sighting via the ICS. School size estimates in 1979 were generally not passed to the recorder in this manner. Estimates were recorded in the Sighting Record at the end of the day

by a designated observer who transferred the information from the personal sighting logs. He was the only observer to have access to other observers' school size estimates. A photographic log was also kept on both surveys (Figures 3 and 4). Sea surface temperature data were recorded using a Barnes PRT-S Precision Radiation Thermometer and Varian G-14 strip chart recorder.

Computer programs were developed to edit the field data for both surveys. These editing programs allow one to specify acceptable range values for any data element, as well as criteria for the logical comparison of elements both within, and between, records. During 1977, and again in 1979, the computer programs used were undocumented. The 1979 data have since been re-edited using documented programs developed during 1980. Appendix 1 indicates the range values specified for editing the 1979 data. Appendix 2 contains the "logical error statements" which reflect specified comparisons among data elements for the 1979 data. These "logical errors" are numbered to reflect the logical comparisons for transect and sighting data. The numbering convention is as follows:

| Logical Error Number | Record Comparisons |
|---|---|
| 1-100 | Single transect record |
| 101-200 | Single sighting record |
| 201-300 | Transect record to sighting record |
| 301-400 | Between transect records |
| 401-500 | Between sighting records |

It should be noted that both range and logical criteria are used to assist in the editing of data and as such do not necessarily reflect the rule for reconciliation of apparent errors.

The original, undocumented edit programs performed many of the same "error checks" as the new 1979 programs. The 1977 data has not been re-edited at this time. Listings of the FORTRAN language computer programs used to edit the 1979 Aerial Survey data are maintained by the Southwest Fisheries Center, La Jolla, California.

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The forms design and coding instructions were reviewed by J. Powers (NMFS, SEFC), R. Holt (NMFS, SWFC), and T. Jackson (NMFS, SWR, NOAA Corps.). P. Metcalf and H. Becker typed the manuscript. R. Holt, D. DeMaster, and A. Coan reviewed the manuscript. The author extends his thanks to these individuals for their assistance.

Table 1. 1979 Aerial survey transect record coding format.

| Columns | Data Element | Explanation or Reference |
|---|---|---|
| | | Record 1 of 1 |
| 1-3 | Left blank to allow for machine merging with sighting record format. | |
| 4-5 | Flight No. | A consecutive number assigned to each flight of the survey. |
| 6-7 | Leg No. (1 to N) | A consecutive number assigned to each of the legs within a particular flight. Leg (1) begins with start of effort and Leg (n) ends upon termination of effort for the day. |
| 8-9 | Year (YR) | The Greenwich Mean Time (GMT) year the leg was flown. |
| 10-11 | Month (MO) | The GMT month the leg was flown. |
| 12-13 | Day | The GMT day the leg was flown. |
| 14-17 | Altitude | The altitude (in feet) of the aircraft at the start of each leg. |
| 18-20 | Ground speed | The aircraft's estimated speed (in knots) over the water recorded at the start of each leg. |
| 21-22 | Bow | The numeric code identifying the individual occupying the nose observation station (see Sighting Record for codes). |
| 23-24 | | Blank. |
| 25-26 | Left waist | The numeric code identifying the individual occupying the left side observation station. |
| 27-28 | Right waist | The numeric code identifying the individual occupying the right side observation station. |
| 29-30 | Recorder | The numeric code identifying the individual occupying the recorder station. |

Table 1. - Continued

| Columns | Data Element | Explanation or Reference |
|---|---|---|
| 31-32 | Horizontal sun position[1] (HORIZ) | At the beginning of the leg, the sun's horizontal clock position in relation to the bow of the aircraft. |
| 33-34 | Vertical Sun Position (VERT) | Sun's vertical position from the horizon to directly overhead using the clock hours between 12 and 3 (i.e. 3, 2, 1, 12 for overhead). |
| 35 | Beaufort No. | Sea state conditions according to the Beaufort scale numeric codes (Table 3). |
| 36-40 | Latitude | The latitude in degrees (2 digits), minutes (2 digits), and tenths of minutes (1 digit). |
| 41 | N/S | Numeric code indicating north or south latitude. North = 1, South = 2. |
| 42-47 | Longitude | The longitude in degrees (3 digits), minutes (2 digits), and tenths of minutes (1 digit). |
| 48 | E/W | Numeric code indicating east or west longitude. East = 1, West = 2. |
| 49-53 | GMT | Greenwich Mean Time in which position was recorded in hours, minutes, and tenths of minutes (based on 24 hour clock). |
| 54 | Reason for Position | Numerically coded reason for recording time and position (See Transect Form, Figure 1, for codes). |

[1]Blanks for both horizontal and vertical position of the sun (columns 31-34) indicated that the sun was obscured by clouds. During the 1977 survey, blanks for the horizontal position alone (columns 31-32) indicated that the sun was directly above and only occurred when the vertical position (columns 33-34) was 12 o'clock. During the 1979 survey, a 12 was entered for horizontal and vertical sun positions to indicate the sun was directly overhead.

Table 1. - Continued

| Columns | Data Element | Explanation or Reference |
|---|---|---|
| 55 | Searching[2] (Y/N) | A numerically coded answer to the question: "was the aircraft engaged in searching effort when the time and position were recorded?" Yes = 1, No = 2. |
| 56-58 | Sighting No. | A consecutive number assigned to each sighting of marine mammals, from 1 to 999, throughout the survey over all flights. |

USAGE NOTES

Each time a position was taken and associated information collected (columns 36-58), a new record was punched. Columns 1-35 were repeated for each position, i.e., for each record within a leg.

Legs were generally 45 minutes in length. This corresponded to observer watches of 45 minutes. At the end of a watch the observer crew rotated. There were five duty stations for observers and one rest station. Sometimes because of sighting activity the watch was extended to facilitate recording of the data. Legs were concluded if sighting conditions changed or if the watch ended.

[2]The plane was not in the search mode (column 55 was equal to 2), if the trackline could not be guarded, i.e., if the basic assumption of transect theory that the probability of sighting an object on the trackline being unity could not be met. Also, the plane was not in the search mode if the reason for taking a position (column 54) was either three or four, indicating the plane had diverted from the trackline.

Table 2. 1979 Aerial survey sighting record coding format.

| Columns | Data Element | Explanation or Reference |
|---|---|---|
| | | Record 1 of 3 |
| 1-3 | Sighting No. | A consecutive number assigned to each sighting of marine mammals during all flights of survey. |
| 4-5 | Flight No. | A consecutive number assigned to each flight of survey indicating the temporal location of the sighting. |
| 6-7 | Leg No. | A consecutive number assigned to each leg of a particular flight indicating the temporal location of the sighting. |
| 8 | Card No. | The number representing the record (1, 2 or 3) associated with this sighting. |
| 9-10 | Year (YR) | The Greenwich Mean Time (GMT) year the sighting was made. |
| 11-12 | Month (MO) | The GMT month the sighting was made. |
| 13-14 | Day | The GMT day the sighting was made. |
| 15-16 | Bow | The numeric code identifying the individual occupying the nose observation station at time of sighting (see form for codes). |
| 17-18 | Left waist | The numeric code identifying the individual occupying the left side observation station at time of sighting. |
| 19-20 | Right waist | The numeric code identifying the individual occupying the right side observation station at time of sighting. |
| 21-22 | Recorder | The numeric code identifying the individual occupying the recorder position at time of sighting. |

Table 2. - Continued

| Columns | Data Element | Explanation or Reference |
|---|---|---|
| 23-24 | Horizontal Sun Position[1] (HORIZ) | At the time of sighting, the sun's horizontal clock position in relation to the bow of the aircraft. |
| 25-26 | Vertical Sun Position[1] (VERT) | Sun's vertical position from the horizon to directly overhead using the clock hours between 12 and 3, at time of sighting (i.e. 3, 2, 1, 12 for overhead). |
| 27-29 | Sea Surf. Temp | Sea surface temperature in °F and tenths as measured by an onboard infraradiometer. |
| 30 | Beaufort No. | Sea state conditions according to the Beaufort scale codes (Table 3) at the time of sighting. |
| 31-32 | Sighted by whom | The numeric code identifying the individual who first made the sighting. |
| 33-35 | Distance (N.M.) | The perpendicular distance, in nautical miles and tenths, between the aircraft and the sighting. |
| 36 | Dist. determined | The numeric code for how the perpendicular distance was computed 1 = GNS, 2 = estimated, 3 = inclinometer. |
| - | L/R | Indicator showing the side of the aircraft trackline where sighting occurred. Not collected in 1977 (L = Left, R = Right). |
| 37-40 | Latitude | The latitude in degrees (2 digits), and minutes (2 digits) at time of sighting, or when over the sighting. |

[1]Blanks for both horizontal and vertical position of the sun (columns 23-26) indicate that the sun was obscured by clouds. During the 1977 survey, blanks for the horizntal position alone (columns 23-24) indicate that the sun is directly above and only occurs when the vertical position (columns 25-26) is 12 o'clock. During the 1979 survey, a 12 was entered for horizontal and vertical sun positions to indicate the sun was directly overhead.

Table 2. - Continued

| Columns | Data Element | Explanation or Reference |
|---|---|---|
| 41 | N/S | Numeric code indicating north or south latitude North = 1, South = 2. |
| 42-46 | Longitude | The longitude in degrees (3 digits), and minutes (2 digits) at time of sighting, or when over the sighting. |
| 47 | E/W | Numeric code indicating east or west longitude. East = 1, West = 2. |
| 48-49 | Obs. Code | The numeric code identifying the observer making the school size estimates for this sighting. |
| 50-53 | Best | The best estimate, for this sighting, of the number of marine mammals sighted by the observer indicated in columns 48-49. |
| 54-57 | Highest | The highest number of marine mammals estimated for this sighting by the observer indicated in columns 48-49. |
| 58-61 | Lowest | The lowest number of marine mammals estimated for this sighting by the observer indicated in columns 48-49. |
| 62-64 | Species 1 percent estimate | The estimated percentage of the total aggregate represented by the species indicated as species (1). |
| 65-66 | Species 1 code[2] | The numeric code identifying the species indicated as species (1) (Table 4). |
| | | Record 2 of 3 |
| 1-3 | Sighting No. | The consecutive number assigned to this sighting of marine mammals, same as Record 1. |

[2]Species codes are those employed by the NMFS tuna vessel observers (Table 4).

Table 2. - Continued

| Columns | Data Element | Explanation or Reference |
|---|---|---|
| 4 | Card No. | The number representing the record (1, 2 or 3) associated with this sighting. |
| 5-6 | Obs. code | The numeric code identifying the observer making school size estimates for this sighting. |
| 7-10 | Best | The best estimate, for this sighting, of the number of marine mammals sighted by the observer indicated in columns 5-6. |
| 11-14 | Highest | The highest number of marine mammals estimated for this sighting by the observer indicated in columns 5-6. |
| 15-18 | Lowest | The lowest number of marine mammals estimated for this sighting by the observer indicated in columns 5-6. |
| 19-21 | Species 2 percent estimate | The estimated percentage of the total aggregate represented by the species indicated as species (2). |
| 22-23 | Species 2 code[2] | The numeric code identifying the species indicated as species (2) (Table 4). |
| 24-37 | School size | Same as columns 5-18 but for a third observer. |
| 38-42 | Species 3[2] | Same as columns 19-23 but for a third species. |
| 43-56 | School size | Same as columns 5-18 but for a fourth observer. |
| 57-61 | Species 4[2] | Same as columns 19-23 but for a fourth species. |
| 62-75 | School size | Same as columns 5-18 but for a fifth observer. |
| 76-80 | Species 5[2] | Same as columns 19-23 but for a fifth species. |

Table 2. - Continued

| Columns | Data Element | Explanation or Reference |
|---|---|---|
| | | Record 3 of 3 |
| Card 3 | | |
| 1-3 | Sighting No. | The consecutive number assigned to this sighting of marine mammals, same as Record 1. |
| 4 | Card No. | The number representing the record (1, 2 or 3) associated with this sighting. |
| 5-18 | School size | Same as columns 5-18 (Card 2) but for a sixth observer. |
| 19 | Porpoise | The numerically coded answer to the question: "were porpoise present with this sighting?" Coded Yes = 1, No = 2. |
| 20 | Birds | The numerically coded answer to the question: "were birds present with this sighting?" Coded Yes = 1, No = 2. |
| 21 | Tuna | The numerically coded answer to the question: "were tuna present with this sighting?" Coded Yes = 1, No = 2. |
| 22-25 | Altitude | The aircraft altitude at the time of 9" photographs were taken. |
| 26 | School mode | The numerically coded behavior of the marine mammals at the time of the 9" photographs. Traveling = 1, Resting = 2, Feeding = 3. |
| 27-29 | Roll No. | The roll number of the 70 mm film containing photographs of this sighting. |
| 30-32 | First frame | The frame number of the current 70 mm roll of film indicating the first photo of this sighting. |
| 33-35 | Last frame | The frame number of the current 70 mm roll of film indicating the last photo of this sighting. |

Table 2. - Continued

| Columns | Data Element | Explanation or Reference |
|---|---|---|
| 36-38 | Roll No. | The roll number of the 9" film containing photographs of this sighting. |
| 39-41 | First frame | The frame number of the current 9" roll of film indicating the first photo of this sighting. |
| 42-44 | Last frame | The frame number of the current 9" roll of film indicating the last photo of this sighting. |
| 45-47 | Roll No. | The roll number of the 35 mm film containing photographs of this sighting. |
| 48-50 | First frame | The frame number of the current 35 mm roll of film indicating the first photo of this sighting. |
| 51-53 | Last frame | The frame number of the current 35 mm roll of film indicating the last photo of this sighting. |
| 54 | Searching cue (WAS PLANE IN SEARCH MODE?) | The numerically coded answer to the question: "Was the plane in a searching mode at time of sighting?" Coded Yes = 1, No = 2. |

Table 3. Beaufort Scale Codes[1]

| Knots | Descriptive | Sea Conditions | Wind force (Beaufort) | Probable wave height in feet |
|---|---|---|---|---|
| 0-1 | Calm | Sea smooth and mirror-like. | 0 | - |
| 1-3 | Light air | Scale-like ripples without foam crests. | 1 | 1/4 |
| 4-6 | Light breeze | Small, short wavelets; crests have a glassy appearance and do not break. | 2 | 1/2 |
| 7-10 | Gentle breeze | Large wavelets; some crests begin to break; foam of glassy appearance. Occasional white foam crests. | 3 | 2 |
| 11-16 | Moderate breeze | Small waves, becoming longer; fairly frequent white foam crests. | 4 | 4 |
| 17-21 | Fresh breeze | Moderate waves, taking a more pronounced long form: many white foam crests; there may be some spray. | 5 | 6 |
| 22-27 | Strong breeze | Large waves begin to form; white foam crests are more extensive everywhere; there may be some spray. | 6 | 10 |
| 28-33 | Near gale | Sea heaps up and white foam from breaking waves begins to be blown in streaks along the direction of the wind; spindrift begins. | 7 | 14 |
| 34-40 | Gale | Moderately high waves of greater length; edges of crests break into spindrift; foam is blown in well-marked streaks along the direction of the wind. | 8 | 18 |
| 41-47 | Strong gale | High waves; dense streaks of foam along the direction of the wind; crests of waves begin to topple, tumble, and roll over; spray may reduce visibility. | 9 | 23 |
| 48-55 | Storm | Very high waves with long overhanging crests. The resulting foam in great patches is blown in dense white streaks along the direction of the wind. On the whole, the surface of the sea is white in appearance. The tumbling of the sea becomes heavy and shocklike. Visibility is reduced. | 10 | 29 |
| 56-63 | Violent storm | Exceptionally high waves that may obscure small and medium-sized ships. The sea is completely covered with long white patches of foam lying along the direction of the wind. Everywhere the edges of the wave crests are blown into froth. Visibility reduced. | 11 | 37 |
| 64-71 | Hurricane | The air is filled with foam and spray. Sea completely white with driving spray; visibility very much reduced. | 12 | 45 |

[1]Bowditch, N. 1966. American Practical Navigator, U.S. Government Printing Office, Hydrographic Office Pub. No. 9, 1524 p.

Table 4. The code table "Porpoise Observer Code Table 04," used by the National Marine Fisheries Service to identify, by numeric codes, species and stocks of cetaceans.

Code Table 04

| Species code | Short Name | Standard Common Name (MMC List, except those in quotes) (Revised December 13, 1977) | Scientific Name |
|---|---|---|---|
| 1 | IATTC porpoise | (1966-1977) any porp sighting (IATTC logbook) | |
| 2 | Offsh.S.Atten. | (1966- ) offshore spotted dolphin | Stenella attenuata |
| 3 | Unid. S.Long. | (1966- ) unid. spinner dolphin | Stenella longirostris |
| 4 | S.Atten.&Long. | (1966- ) spotted and spinner dolphin | |
| 5 | Unid. delph. | (1966- ) unid. common dolphin | Delphinus delphis |
| 6 | Coast.S.Atten. | (1966- ) coastal spotted dolphin | S.A. graffmani |
| 7 | Delph.&S.Long. | (1966-1977) "whitebellies & spinners" | |
| 8 | Delph.&S.Atten | (1966-1977) "whitebellies & spotters" | |
| 9 | | (1966-1977) unid. delph., W. B. & unid spinners | |
| 10 | Eastrn.S.Long. | (1966- ) eastern spinner dolphin | Stenella longirostris subsp.B. |
| 11 | Whiteb.S.Long. | (1966- ) whitebelly spinner dolphin | Stenella longirostris subsp.C. |
| 12 | Hawaii S.Long. | (1966- ) Hawaiian spinner dolphin | S. longirostris subsp. D. |
| 13 | S.coeruleoalba | (1966- ) unid. striped dolphin | S. coeruleoalba |
| 14 | Hawaii S.Atten | (1966- ) Hawaiian spotted dolphin | S. attenuata subsp. B. |
| 15 | Steno | (1966- ) rough-toothed dolphin | Steno Bredanensis |
| 16 | Longbk. Delph. | (1966-1977) "long-snouted whitebelly" | Delphinus delphis subsp. ? |
| 17 | Shortbk.Delph. | (1966-1977) "short-snouted whitebelly" | Delphinus delphis subsp. ? |
| 18 | Tursiops | (1966- ) unid. bottlenosed dolphins | Tursiops truncatus |
| 19 | T. truncatus | (1966-1977) "offshore bottlenosed dolphins" | Tursiops truncatus subsp. ? |
| 20 | | (1966-1977) "inshore bottlenosed dolphins" | Tursiops truncatus subsp. ? |

Code Table 04 - Continued

| Species code | Short Name | Standard Common Name (MMC List, except those in quotes) (Revised December 13, 1977) | Scientific Name |
|---|---|---|---|
| 21 | Grampus | (1966- ) Risso's dolphin | Grampus griseus |
| 22 | Lagenorhynchus | (1966- ) Pacific white-sided dolphin | Lagenorhynchus obliquidens |
| 25 | | (1966- ) Dusky dolphin | L. obscurus |
| 26 | Lagenodelphis | (1966- ) Fraser's dolphin | Lagenodelphis hosei |
| 27 | Lissodelphis | (1966- ) northern right whale dolphin | Lissodelphis borealis |
| 31 | Peponocephala | (1966- ) melon-headed whale | Peponocephala electra |
| 32 | Feresa | (1966- ) pygmy killer whale | Feresa attenuata |
| 33 | Pseudorca | (1966- ) false killer whale | Pseudorca crassidens |
| 34 | Globicephala | (1966- ) unid. pilot whale | Globicephala sp. |
| 35 | | (1966- ) long-finned pilot whale | Globicephala melaena |
| 36 | | (1966- ) short-finned pilot whale | Globicephala macrorhynchus |
| 37 | | (1966- ) killer whale | Orcinas orca |
| 40 | | (1966- ) harbor porpoise | Phocoaena phocoaena |
| 41 | | (1966- ) Cochito | P. sinus |
| 42 | | (1966- ) Burmeister's porpoise | P. spinipinnis |
| 44 | | (1966- ) Dall's porpoise | Phocoenoides dalli |
| 46 | | (1966- ) sperm whale | Physeter catodon |
| 47 | | (1966- ) pygmy sperm whale | Kogia brevicops |
| 48 | | (1966- ) dwarf sperm whale | Kogia simus |
| 49 | | (1966- ) unid. beaked whale | Ziphiid |

Code Table 04 - Continued

| Species code | Short Name | Standard Common Name (MMC List, except those in quotes) (Revised December 13, 1977) | Scientific Name |
|---|---|---|---|
| 50 | | (1966- ) southern bottlenosed whale | Hyperoodon planifrons |
| 51 | Mesoplodont | (1966- ) unid. mesoplodon | Mesoplodon sp. |
| 61 | | (1966- ) Cuvier's beaked whale | Ziphius cavirostris |
| 62 | | (1966- ) Arnoux's beaked whale | Berardius arnouxi |
| 64 | | (1966- ) Shepherd's beaked whale | Tasmacetus shepherdi |
| 66 | | (1966- ) northern right whale | Eubalaena glacialis |
| 67 | | (1966- ) bowhead whale | Balaena mysticetus |
| 68 | | (1966- ) pygmy right whale | Caperea marginata |
| 69 | | (1966- ) gray whale | Eschrichtius robustus |
| 70 | Unid. rorqual | (1966- ) unid. rorqual | Balaenoptera sp. |
| 71 | | (1966- ) Minke whale | B. acutorostrata, B. bonaerensis |
| 72 | | (1966- ) Bryde's whale | B. edeni |
| 73 | | (1966- ) Sei whale | B. borealis |
| 74 | | (1966- ) fin whale | B. physalus |
| 75 | | (1966- ) blue whale | B. musculus |
| 76 | Humpback whale | (1966- ) humpback whale | Megaptera novaeangline |
| 77 | Unid. porpoise | (1966- ) unidentified dolphin or porpoise | |
| 73 | Unid.Sml.Whale | (1966- ) unidentified small whale | |
| 79 | Unid.Lrg.Whale | (1966- ) unidentified large whale | |
| 80 | | (74 AERSVY) tunaboat/purse seiner | |

Code Table 04 - Continued

| Species code | Short Name | Standard Common Name (MMC List, except those in quotes) (Revised December 13, 1977) | Scientific Name |
|---|---|---|---|
| 81 | | (74 AERSVY) baitboat | |
| 82 | | (74 AERSVY) unidentified schoolfish | |
| 83 | | (74 AERSVY) schoolfish/tuna YF | |
| 84 | | (74 AERSVY) schoolfish/skipjack | |
| 85 | | (74 AERSVY) baitfish | |
| 86 | | (74 AERSVY) floating object/Flotsam | |
| 88 | | (1966- ) Costa Rican spinner dolphin | Stenella longirostris subsp.A |
| 89 | Lag.H. & S.Co. | (1974-1977) Fraser's dolphin & striped dolphin | Lagenodelphis hosei & Stenella coeruleoalba |
| 90 | Unid. S.Atten. | (1977- ) unid. spotted dolphin | Stenella attenuata |
| 91 | Northern delph | (not used ) northern common dolphin | Delphinus delphis subsp. ? |
| 92 | Central delph | (not used ) central common dolphin | Delphinus delphis subsp. ? |
| 93 | Southern delph | (not used ) southern common dolphin | Delphinus delphis subsp. ? |
| 94 | Northern S.Coe | (not used ) northern striped dolphin | S. coeruleoalba subsp. ? |
| 95 | Southern S.Coe | (not used ) southern striped dolphin | S. coeruleoalba subsp. ? |
| 96 | | (1977- ) unidentified cetacean | |
| 97 | | (1977- ) unid. obj., possible marine mammal | |
| 98 | | (1977- ) unidentified whale | |

Figure 1. **1979 AERIAL SURVEY TRANSECT RECORD**

FLIGHT. _____ LEG: _____ DATE: _____

FROM: _____ TO: _____

| BLANK | FLIGHT NO. | LEG NO. | DATE YR | DATE MO | DATE DAY | ALTITUDE (FEET) | GROUND SPEED (KNOTS) |
|---|---|---|---|---|---|---|---|
| X | | | | | | | |
| 1 | 4 | 6 | 8 | 10 | 12 | 14 | 18 |

OBSERVER CODES

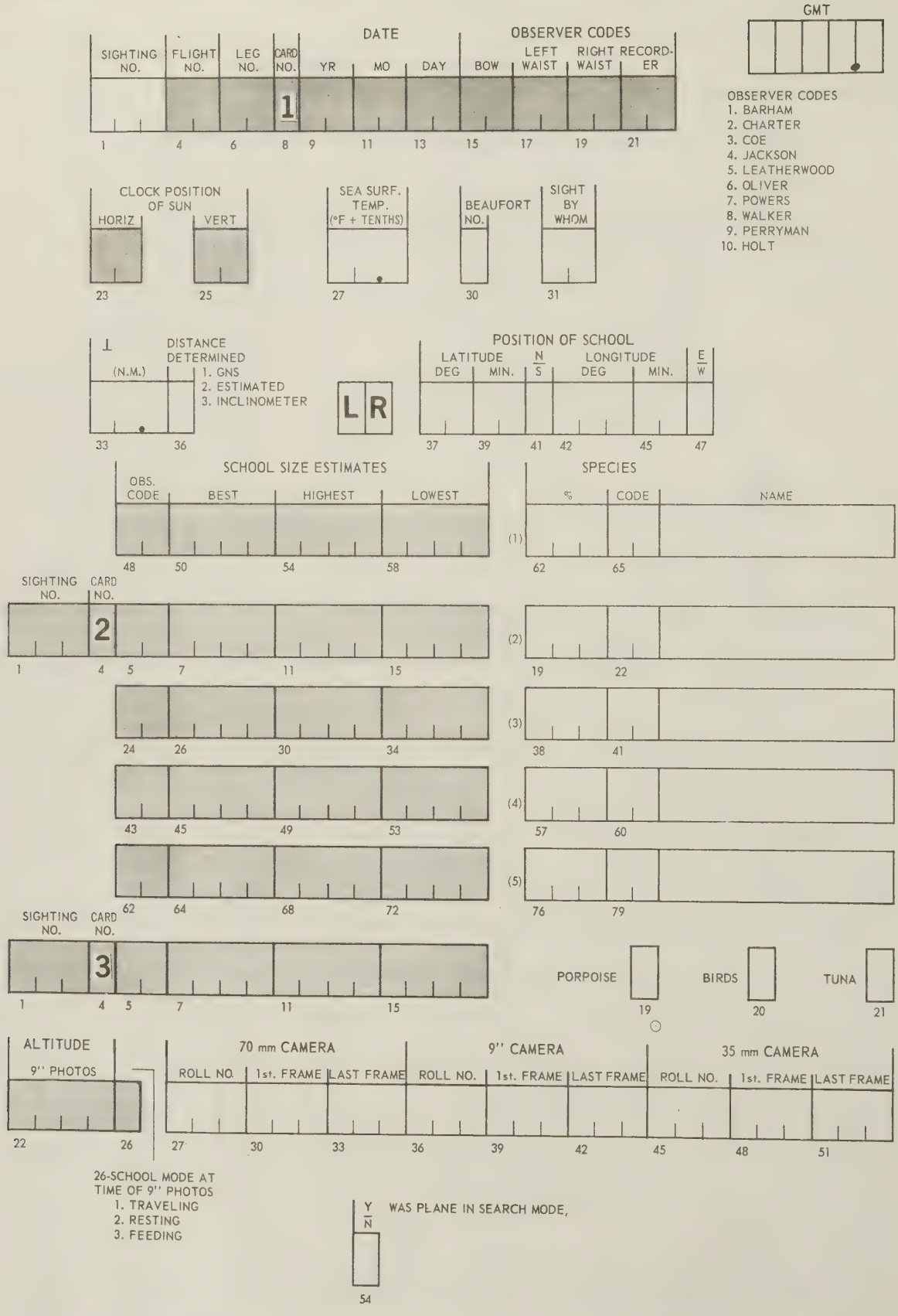
| BOW | BLANK | LEFT WAIST | RIGHT WAIST | RECORDER | SUN POSITION HORIZ. | SUN POSITION VERT | BEAUFORT NO. |
|---|---|---|---|---|---|---|---|
| | X | | | | | | |
| 21 | 23 | 25 | 27 | 29 | 31 | 33 | 35 |

REASON FOR POSITION
1. Begin Leg
2. Track Check
3. Divert
4. Overschool
5. Return
6. End Leg

| LATITUDE DEG. | LATITUDE MIN. | N/S | LONGITUDE DEG. | LONGITUDE MIN. | E/W | G.M.T. | | SEARCHING Y/N | SIGHTING NO. |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |
| 36 | 38 | 41 | 42 | 45 | 48 | 49 | 53 | 54 | 55 | 56 | 58 |

NOAA FORM No. 88-174 1/79

Figure 2. **1979 AERIAL SURVEY SIGHTING RECORD**




NOAA FORM No. 88-173 1/79

Figure 3. 1977 Aerial survey camera log.

Flight Number _____ Sighting Number _____

Date _____ ~ Time of Sighting _____
(Note local or GMT)

Note altitude, f/stop, shutter speed, ASA,
% of school photographed, etc. when possible.

---

9" CAMERA

Camera body # _____

Intervalometer # _____

Begin _____ End _____

HASSELBLAD CAMERA

Roll # _____ Frames _____

Roll # _____ Frames _____

Roll # _____ Frames _____

35 mm CAMERA

Roll # _____ Frames _____

MOVIE CAMERA

Roll # _____ Footage _____

Figure 4. 1979 aerial survey camera log.

Sighting # _____ Flight # _____ Observer # _____

9" CAMERA

| Intervalometer Reading | PASS # 1 | | PASS # 2 | |
|---|---|---|---|---|
| | Begin | End | Begin | End |
| | _____ | _____ | _____ | _____ |
| | PASS # 3 | | PASS # 4 | |
| | Begin | End | Begin | End |
| | _____ | _____ | _____ | _____ |

Altitude _____ NOTES: (School Configuration/% of School in Frame)

HASSELBLAD

| | | | |
|---|---|---|---|
| Back # _____ | Back # _____ | Back # _____ |
| Roll # _____ | Roll # _____ | Roll # _____ |

F Stop _____ Shutter Speed _____ Altitude _____

Motion Pictures

Roll # _____

35 mm

Roll # _____

Frames _____

NOTES:

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

Southwest Fisheries Center
P. O. Box 271
La Jolla, California 92038

October 31, 1983 F/SWC1

TO: Distribution

FROM: Chuck Oliver Chuck

SUBJECT: Documentation of Aerial Survey Sighting and Transect Forms for the 1977 and 1979 Eastern Tropical Pacific Cetacean Surveys (Admin. Rpt. No. LJ-83-20)

The attached pages (22.1-22.4) reflect the range and blankness checks performed on the 1977 data as described in this report. These pages can be inserted into the report between pages 22 and 23.

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APPENDIX I

1977 AERIAL TRANSECT FORM
Data Element Blankness and Range Editing Specifications
Record 1 of 1

| Data Element | Columns | Character type | Blankness OK? | Range Lower | Range Upper |
|---|---|---|---|---|---|
| Flight | 4-5 | N | No | 1 | 11 |
| Leg | 6-7 | N | No | 1 | 20 |
| Year | 8-9 | N | No | 77 | 77 |
| Month | 10-11 | N | No | 1 | 4 |
| Day | 12-13 | N | No | 1 | 31 |
| Altitude | 14-17 | N | No | 1000 | 1500 |
| Ground speed | 18-20 | N | Yes | 140 | 180 |
| Bow obs code | 21-22 | N | No | 1 | 7 |
| Left obs code | 25-26 | N | No | 1 | 7 |
| Right obs code | 27-28 | N | No | 1 | 7 |
| Recorder code | 29-30 | N | No | 1 | 7 |
| Horizontal sun | 31-32 | N | Yes | 1 | 12 |
| Vertical sun | 33-34 | N | Yes | 1 | 12 |
| Beaufort | 35 | N | No | 0 | 6 |
| LATD (Latitude Degs) | 36-37 | N | No | 0 | 32 |
| Latitude minutes (no 10ths) | 38-39 | N | No | 0 | 59 |
| Latitude minutes to 10ths | 40 | N | No | 0 | 9 |
| N or S (Hemisphere) | 41 | N | No | 1 | 2 |
| LONGD (Longitude Degs) | 42-44 | N | No | 90 | 125 |
| Longitude minutes (no 10ths) | 45-46 | N | No | 0 | 59 |
| Longitude minutes to 10ths | 47 | N | No | 0 | 9 |
| E or W (Hemisphere) | 48 | N | No | 2 | 2 |
| Greenwich time | 49-52 | N | No | 300 | 2400 |
| GMT to 10ths | 53 | N | No | 0 | 9 |
| Reason position | 54 | N | No | 1 | 6 |
| Searching | 55 | N | No | 1 | 2 |
| Sighting number | 56-58 | N | Yes | 1 | 70 |

A = ALPHA B = BLANK C = COMMA N = NUMERIC

APPENDIX I

1977 AERIAL SIGHTING FORM
Data Element Blankness and Range Editing Specifications
Record 1 of 3

| Data Element | Columns | Character type | Blankness OK? | Range Lower | Range Upper |
|---|---|---|---|---|---|
| Sight | 1-3 | N | No | 1 | 70 |
| Flight | 4-5 | N | No | 1 | 11 |
| Leg | 6-7 | N | No | 1 | 20 |
| Year | 9-10 | N | No | 77 | 77 |
| Month | 11-12 | N | No | 1 | 4 |
| Day | 13-14 | N | No | 1 | 31 |
| Bow obs code | 15-16 | N | No | 1 | 7 |
| Left obs code | 17-18 | N | No | 1 | 7 |
| Right obs code | 19-20 | N | No | 1 | 7 |
| Recorder code | 21-22 | N | No | 1 | 7 |
| Horizontal sun | 23-24 | N | Yes | 1 | 12 |
| Vertical sun | 25-26 | N | Yes | 1 | 12 |
| Sea surface temp | 27-28 | N | Yes | 78 | 83 |
| Sea surface temp to 10ths | 29 | N | Yes | 0 | 9 |
| Beaufort | 30 | N | No | 0 | 6 |
| Sighter | 31-32 | N | No | 1 | 7 |
| Perpendicular | 33-34 | N | Yes | 0 | 1 |
| Perpendicular distance to 10ths | 35 | N | Yes | 0 | 9 |
| Determined how | 36 | N | Yes | 1 | 3 |
| LATD | 37-38 | N | No | 0 | 32 |
| LATM | 39-40 | N | No | 0 | 59 |
| N or S (Hemisphere) | 41 | N | No | 1 | 2 |
| LONGD | 42-44 | N | No | 90 | 125 |
| LONGM | 45-46 | N | No | 0 | 59 |
| E or W (Hemisphere) | 47 | N | No | 2 | 2 |
| E1 obs code | 48-49 | N | No | 1 | 7 |
| E1 best est | 50-53 | N | Yes | 1 | 300 |
| E1 highest est | 54-57 | N | Yes | 1 | 500 |
| E1 lowest est | 58-61 | N | Yes | 1 | 300 |
| SP1 percent tot | 62-64 | N | No | 50 | 100 |
| SP1 code | 65-66 | N | No | 1 | 77 |

A = ALPHA B = BLANK C = COMMA N = NUMERIC

APPENDIX I

1977 AERIAL SIGHTING FORM
Data Element Blankness and Range Editing Specifications
Record 2 of 3

| Data Element | Columns | Character type | Blankness OK? | Range Lower | Range Upper |
|---|---|---|---|---|---|
| Sight | 1-3 | N | No | 1 | 70 |
| E2 obs code | 5-6 | N | Yes | 1 | 7 |
| E2 best est | 7-10 | N | Yes | 1 | 300 |
| E2 highest est | 11-14 | N | Yes | 1 | 500 |
| E2 lowest est | 15-18 | N | Yes | 1 | 300 |
| SP2 percent tot | 19-21 | N | Yes | 1 | 100 |
| SP2 code | 22-23 | N | Yes | 1 | 77 |
| E3 obs code | 24-25 | N | Yes | 1 | 7 |
| E3 best est | 26-29 | N | Yes | 1 | 300 |
| E3 highest est | 30-33 | N | Yes | 1 | 500 |
| E3 lowest est | 34-37 | N | Yes | 1 | 300 |
| SP3 percent tot | 38-40 | N | Yes | 1 | 100 |
| SP3 code | 41-42 | N | Yes | 1 | 77 |
| E4 obs code | 43-44 | N | Yes | 1 | 7 |
| E4 best est | 45-48 | N | Yes | 1 | 300 |
| E4 highest est | 49-52 | N | Yes | 1 | 500 |
| E4 lowest est | 53-56 | N | Yes | 1 | 300 |
| SP4 percent tot | 57-59 | N | Yes | 1 | 100 |
| SP4 code | 60-61 | N | Yes | 1 | 77 |
| E5 obs code | 62-63 | N | Yes | 1 | 7 |
| E5 best est | 64-67 | N | Yes | 1 | 300 |
| E5 highest est | 68-71 | N | Yes | 1 | 500 |
| E5 lowest est | 72-75 | N | Yes | 1 | 300 |
| SP5 percent tot | 76-78 | N | Yes | 1 | 100 |
| SP5 code | 79-80 | N | Yes | 1 | 77 |

A = ALPHA B = BLANK C = COMMA N = NUMERIC

APPENDIX I

1977 AERIAL SIGHTING FORM
Data Element Blankness and Range Editing Specifications
Record 3 of 3

| Data Element | Columns | Character type | Blankness OK? | Range Lower | Range Upper |
|---|---|---|---|---|---|
| Sight | 1-3 | N | No | 1 | 70 |
| E6 obs code | 5-6 | N | Yes | 1 | 7 |
| E6 best est | 7-10 | N | Yes | 1 | 300 |
| E6 highest est | 11-14 | N | Yes | 1 | 500 |
| E6 lowest est | 15-18 | N | Yes | 1 | 300 |
| Porpoise (Y/N) | 19 | N | No | 1 | 2 |
| Birds (Y/N) | 20 | N | No | 1 | 2 |
| Tuna (Y/N) | 21 | N | No | 1 | 2 |
| Inch 9 flyover (altitude) | 22-25 | N | Yes | 1000 | 1500 |
| School mode | 26 | N | Yes | 1 | 3 |
| Roll num 70M1 | 27-29 | N | Yes | 1 | 36 |
| First frame 70M1 | 30-32 | N | Yes | 2 | 11 |
| Last frame 70M1 | 33-35 | N | Yes | 3 | 12 |
| Roll num 9 in | 36-38 | N | Yes | 1 | 2 |
| First frame 9 in | 39-41 | N | Yes | 2 | 125 |
| Last frame 9 in | 42-44 | N | Yes | 3 | 126 |
| Roll num 35M | 45-47 | N | Yes | 1 | 24 |
| First frame 35M | 48-50 | N | Yes | 2 | 35 |
| Last frame 35M | 51-53 | N | Yes | 3 | 36 |
| Good bad ugly | 54 | N | No | 1 | 2 |
| Roll num 70M2 | 55-57 | N | Yes | 2 | 36 |
| First frame 70M2 | 58-60 | N | Yes | 2 | 11 |
| Last frame 70M2 | 61-63 | N | Yes | 3 | 12 |

A = ALPHA B = BLANK C = COMMA N = NUMERIC

# APPENDIX I

## 1979 AERIAL TRANSECT FORM
## Data Element Blankness and Range Editing Specifications
## Record 1 of 1

| Data Element | Columns | Character type | Blankness OK? | Range Lower | Range Upper |
|---|---|---|---|---|---|
| Flight | 4-5 | N | No | 1 | 20 |
| Leg | 6-7 | N | No | 1 | 25 |
| Year | 8-9 | N | No | 79 | 79 |
| Month | 10-11 | N | No | 1 | 4 |
| Day | 12-13 | N | No | 1 | 31 |
| Altitude | 14-17 | N | No | 850 | 1100 |
| Ground speed | 18-20 | N | Yes | 85 | 140 |
| Bow obs code | 21-22 | N | No | 4 | 11 |
| Left obs code | 25-26 | N | No | 4 | 11 |
| Right obs code | 27-28 | N | No | 4 | 11 |
| Recorder code | 29-30 | N | No | 4 | 11 |
| Horizontal sun | 31-32 | N | Yes | 1 | 12 |
| Vertical sun | 33-34 | N | Yes | 1 | 12 |
| Beaufort | 35 | N | No | 1 | 5 |
| LATD (Latitude Degs) | 36-37 | N | No | 0 | 28 |
| Latitude minutes (no 10ths) | 38-39 | N | No | 0 | 59 |
| Latitude minutes to 10ths | 40 | N | No | 0 | 9 |
| N or S (Hemisphere) | 41 | N | No | 1 | 2 |
| LONGD (Longitude Degs) | 42-44 | N | No | 78 | 113 |
| Longitude minutes (no 10ths) | 45-46 | N | No | 0 | 59 |
| Longitude minutes to 10ths | 47 | N | No | 0 | 9 |
| E or W (Hemisphere) | 48 | N | No | 2 | 2 |
| Greenwich time | 49-52 | N | No | 0 | 2359 |
| GMT to 10ths | 53 | N | No | 0 | 9 |
| Reason position | 54 | N | No | 1 | 6 |
| Searching | 55 | N | No | 1 | 2 |
| Sighting number | 56-58 | N | Yes | 1 | 387 |

A = ALPHA  B = BLANK  C = COMMA  N = NUMERIC

APPENDIX I

1979 AERIAL SIGHTING FORM
Data Element Blankness and Range Editing Specifications
Record 1 of 3

| Data Element | Columns | Character type | Blankness OK? | Range Lower | Range Upper |
|---|---|---|---|---|---|
| Sight | 1-3 | N | No | 1 | 387 |
| Flight | 4-5 | N | No | 1 | 20 |
| Leg | 6-7 | N | No | 1 | 25 |
| Year | 9-10 | N | No | 79 | 79 |
| Month | 11-12 | N | No | 1 | 4 |
| Day | 13-14 | N | No | 1 | 31 |
| Bow obs code | 15-16 | N | No | 4 | 10 |
| Left obs code | 17-18 | N | No | 4 | 10 |
| Right obs code | 19-20 | N | No | 4 | 10 |
| Recorder code | 21-22 | N | No | 4 | 10 |
| Horizontal sun | 23-24 | N | Yes | 1 | 12 |
| Vertical sun | 25-26 | N | Yes | 1 | 12 |
| Sea surface temp | 27-28 | N | Yes | 75 | 84 |
| Sea surface temp to 10ths | 29 | N | Yes | 0 | 9 |
| Beaufort | 30 | N | No | 1 | 5 |
| Sighter | 31-32 | N | No | 4 | 10 |
| Perpendicular | 33-34 | N | Yes | 0 | 1 |
| Perpendicular distance to 10ths | 35 | N | Yes | 0 | 9 |
| Determined how | 36 | N | Yes | 1 | 3 |
| LATD | 37-38 | N | No | 0 | 28 |
| LATM | 39-40 | N | No | 0 | 59 |
| N or S (Hemisphere) | 41 | N | No | 1 | 2 |
| LONGD | 42-44 | N | No | 78 | 113 |
| LONGM | 45-46 | N | No | 0 | 59 |
| E or W (Hemisphere) | 47 | N | No | 2 | 2 |
| E1 obs code | 48-49 | N | No | 4 | 10 |
| E1 best est | 50-53 | N | Yes | 1 | 500 |
| E1 highest est | 54-57 | N | Yes | 1 | 1000 |
| E1 lowest est | 58-61 | N | Yes | 1 | 400 |
| SP1 percent tot | 62-64 | N | No | 50 | 100 |
| SP1 code | 65-66 | N | No | 2 | 79 |

A = ALPHA B = BLANK C = COMMA N = NUMERIC

# APPENDIX I

## 1979 AERIAL SIGHTING FORM
## Data Element Blankness and Range Editing Specifications
## Record 2 of 3

| Data Element | Columns | Character type | Blankness OK? | Range Lower | Range Upper |
|---|---|---|---|---|---|
| Sight | 1-3 | N | No | 1 | 387 |
| E2 obs code | 5-6 | N | Yes | 4 | 10 |
| E2 best est | 7-10 | N | Yes | 1 | 500 |
| E2 highest est | 11-14 | N | Yes | 1 | 1000 |
| E2 lowest est | 15-18 | N | Yes | 1 | 400 |
| SP2 percent tot | 19-21 | N | Yes | 1 | 50 |
| SP2 code | 22-23 | N | Yes | 2 | 79 |
| E3 obs code | 24-25 | N | Yes | 4 | 10 |
| E3 best est | 26-29 | N | Yes | 1 | 500 |
| E3 highest est | 30-33 | N | Yes | 1 | 1000 |
| E3 lowest est | 34-37 | N | Yes | 1 | 400 |
| SP3 percent tot | 38-40 | N | Yes | 1 | 25 |
| SP3 code | 41-42 | N | Yes | 2 | 79 |
| E4 obs code | 43-44 | N | Yes | 4 | 10 |
| E4 best est | 45-48 | N | Yes | 1 | 500 |
| E4 highest est | 49-52 | N | Yes | 1 | 1000 |
| E4 lowest est | 53-56 | N | Yes | 1 | 400 |
| SP4 percent tot | 57-59 | N | Yes | 1 | 25 |
| SP4 code | 60-61 | N | Yes | 2 | 79 |
| E5 obs code | 62-63 | N | Yes | 4 | 10 |
| E5 best est | 64-67 | N | Yes | 1 | 500 |
| E5 highest est | 68-71 | N | Yes | 1 | 1000 |
| E5 lowest est | 72-75 | N | Yes | 1 | 400 |
| SP5 percent tot | 76-78 | N | Yes | 1 | 25 |
| SP5 code | 79-80 | N | Yes | 2 | 79 |

A = ALPHA B = BLANK C = COMMA N = NUMERIC

# APPENDIX I

## 1979 AERIAL SIGHTING FORM
## Data Element Blankness and Range Editing Specifications
## Record 3 of 3

| Data Element | Columns | Character type | Blankness OK? | Range Lower | Range Upper |
|---|---|---|---|---|---|
| Sight | 1-3 | N | No | 1 | 387 |
| E6 obs code | 5-6 | N | Yes | 4 | 10 |
| E6 best est | 7-10 | N | Yes | 1 | 500 |
| E6 highest est | 11-14 | N | Yes | 1 | 1000 |
| E6 lowest est | 15-18 | N | Yes | 1 | 400 |
| Porpoise (Y/N) | 19 | N | No | 1 | 2 |
| Birds (Y/N) | 20 | N | No | 1 | 2 |
| Tuna (Y/N) | 21 | N | No | 1 | 2 |
| Inch 9 flyover (altitude) | 22-25 | N | Yes | 600 | 1200 |
| School mode | 26 | N | Yes | 1 | 3 |
| Roll num 70M1 | 27-29 | N | Yes | 1 | 22 |
| First frame 70M1 | 30-32 | N | Yes | 1 | 11 |
| Last frame 70M1 | 33-35 | N | Yes | 2 | 12 |
| Roll num 9 in | 36-38 | N | Yes | 1 | 4 |
| First frame 9 in | 39-41 | N | Yes | 1 | 400 |
| Last frame 9 in | 42-44 | N | Yes | 1 | 400 |
| Roll num 35M | 45-47 | N | Yes | 1 | 5 |
| First frame 35M | 48-50 | N | Yes | 1 | 35 |
| Last frame 35M | 51-53 | N | Yes | 2 | 36 |
| Good bad ugly | 54 | N | No | 1 | 2 |
| Roll num 70M2 | 55-57 | N | Yes | 1 | 22 |
| First frame 70M2 | 58-60 | N | Yes | 1 | 11 |
| Last frame 70M2 | 61-63 | N | Yes | 2 | 12 |

A = ALPHA B = BLANK C = COMMA N = NUMERIC

# APPENDIX II

## Logical Error Criteria

## 1979 Aerial Transect and Sighting Data

ERROR001 IF THE REASON FOR THE POSITION IS TO DIVERT (1.54=3) ... THEN THE PLANE MUST NOT BE SEARCHING-(1.55) MUST BE EQUAL TO 2.

ERROR002 IF THE REASON FOR THE POSITION IS RETURN TO TRACK (1.54=5) THEN THE PLANE MUST BE SEARCHING...(1.55) MUST BE EQUAL TO 1.

ERROR003 IF THE REASON FOR THE POSITION IS END LEG (1.54=6), THEN THE PLANE MUST BE SEARCHING... (1.55) MUST BE EQUAL TO 1.

ERROR004 IF THE REASON FOR THE POSITION IS BEGIN LEG (1.54=1), THEN THE PLANE MUST BE SEARCHING... (1.55) MUST BE EQUAL TO 1.

ERROR005 IF THE REASON FOR THE POSITION IS TRACK CHECK (1.54=2), THEN THE PLANE SHOULD BE SEARCHING ... (1.55) MUST BE EQUAL TO 1.

ERROR006 THE VERTICAL SUN POSITION (1.33) MUST NOT BE EQUAL TO ANY VALUE 04 THRU 11.

ERROR007 IF THE FLIGHT # (1.04) IS 01 AND THE BOW OBSERVER (1.21) IS 10... THEN THE OTHER OBSERVERS (1.25, 1.27, 1.29) MUST EQUAL 080506.

ERROR008 IF THE FLIGHT # (1.04) IS 01 AND THE BOW OBSERVER (1.21) IS 04... THEN THE OTHER OBSERVERS (1.25, 1.27, 1.29) MUST EQUAL 060910.

ERROR009 IF THE FLIGHT # (1.04) IS 01 AND THE BOW OBSERVER (1.21) IS 05... THEN THE OTHER OBSERVERS (1.25, 1.27, 1.29) MUST EQUAL 100804.

ERROR010 IF THE FLIGHT # (1.04) IS 01 AND THE BOW OBSERVER (1.21) IS 09... THEN THE OTHER OBSERVERS (1.25, 1.27, 1.29) MUST EQUAL 040605.

ERROR011 IF THE FLIGHT # (1.04) IS 02 THRU 17 AND THE BOW OBSERVER (1.21) IS 10... THEN THE OTHER OBSERVERS (1.25, 1.27, 1.29) MUST EQUAL 050609.

ERROR012 IF THE FLIGHT # (1.04) IS 02 THRU 17 AND THE BOW OBSERVER (1.21) IS 06... THEN THE OTHER OBSERVERS (1.25, 1.27, 1.29) MUST EQUAL 100508.

ERROR013 IF THE FLIGHT # (1.04) IS 02 THRU 17 AND THE BOW OBSERVER (1.21) IS 04... THEN THE OTHER OBSERVERS (1.25, 1.27, 1.29) MUST EQUAL 080906.

ERROR014 IF THE FLIGHT # (1.04) IS 02 THRU 17 AND THE BOW OBSERVER (1.21) IS 09... THEN THE OTHER OBSERVERS (1.25, 1.27, 1.29) MUST EQUAL 040805.

ERROR015 IF THE FLIGHT # (1.04) IS 02 THRU 17 AND THE BOW OBSERVER (1.21) IS 08... THEN THE OTHER OBSERVERS (1.25, 1.27, 1.29) MUST EQUAL 090410.

ERROR016 IF THE FLIGHT # (1.04) IS 02 THRU 17 AND THE BOW OBSERVER (1.21) IS 05... THEN THE OTHER OBSERVERS (1.25, 1.27, 1.29) MUST EQUAL 061004.

ERROR017 IF THE FLIGHT # (1.04) IS 18 THRU 20 AND THE BOW OBSERVER (1.21) IS 10... THEN THE OTHER OBSERVERS (1.25, 1.27, 1.29) MUST EQUAL 041109.

ERROR018 IF THE FLIGHT # (1.04) IS 18 THRU 20 AND THE BOW OBSERVER (1.21) IS 06... THEN THE OTHER OBSERVERS (1.25, 1.27, 1.29) MUST EQUAL 090410.

ERROR019 IF THE FLIGHT # (1.04) IS 18 THRU 20 AND THE BOW OBSERVER (1.21) IS 11... THEN THE OTHER OBSERVERS (1.25, 1.27, 1.29) MUST EQUAL 100906.

ERROR020 IF THE FLIGHT # (1.04) IS 18 THRU 20 AND THE BOW OBSERVER (1.21) IS 04... THEN THE OTHER OBSERVERS (1.25, 1.27, 1.29) MUST EQUAL 061011.

ERROR021 IF THE FLIGHT # (1.04) IS 18 THRU 20 AND THE BOW OBSERVER (1.21) IS 09... THEN THE OTHER OBSERVERS (1.25, 1.27, 1.29) MUST EQUAL 110604.

ERROR022 IF THE CURRENT SIGHTING # (1.56) IS NON BLANK ...THEN THE CURRENT SIGHTING # MUST BE EQUAL TO THE LAST NON BLANK SIGHTING # PLUS 1.

ERROR023 IF THE CURRENT SIGHTING # (1.56) IS NON BLANK ...THEN THE CURRENT REASON FOR POSITION(1.54) SHOULD NOT GENERALLY BE EQUAL TO 1, 5, OR 6.

ERROR101 THE VERTICAL SUN POSITION (1.25) MUST NOT BE EQUAL TO ANY VALUE 04 THRU 11.

ERROR102 IF THE FLIGHT # (1.04) IS 01 AND THE BOW OBSERVER (1.15) IS 10... THEN THE OTHER OBSERVERS (1.17, 1.19, 1.21) MUST EQUAL 080506.

ERROR103 IF THE FLIGHT # (1.04) IS 01 AND THE RECORDER (1.21) IS 06... THEN WHO MADE THE SIGHTING (1.31) SHOULD BE EQUAL TO 10 OR 08 OR 05.

ERROR104 IF THE FLIGHT # (1.04) IS 01 AND THE BOW OBSERVER (1.15) IS 04... THEN THE OTHER OBSERVERS (1.17, 1.19, 1.21) MUST EQUAL 060910.

ERROR105 IF THE FLIGHT # (1.04) IS 01 AND THE RECORDER (1.21) IS 10... THEN WHO MADE THE SIGHTING (1.31) SHOULD BE EQUAL TO 04 OR 06 OR 09.

ERROR106 IF THE FLIGHT # (1.04) IS 01 AND THE BOW OBSERVER (1.15) IS 05... THEN THE OTHER OBSERVERS (1.17, 1.19, 1.21) MUST EQUAL 100804.

ERROR107 IF THE FLIGHT # (1.04) IS 01 AND THE RECORDER (1.21) IS 04... THEN WHO MADE THE SIGHTING (1.31) SHOULD BE EQUAL TO 04 OR 06 OR 09.

ERROR108 IF THE FLIGHT # (1.04) IS 01 AND THE BOW OBSERVER (1.15) IS 09... THEN THE OTHER OBSERVERS (1.17, 1.19, 1.21) MUST EQUAL 040605.

ERROR109 IF THE FLIGHT # (1.04) IS 01 AND THE RECORDER (1.21) IS 05... THEN WHO MADE THE SIGHTING (1.31) SHOULD BE EQUAL TO 09 OR 04 OR 06.

ERROR110 IF THE FLIGHT # (1.04) IS 02 THRU 17 AND THE BOW OBSERVER (1.15) IS 10... THEN THE OTHER OBSERVERS (1.17, 1.19, 1.21) MUST EQUAL 050609.

ERROR111 IF THE FLIGHT # (1.04) IS 02 THRU 17 AND THE RECORDER (1.21) IS 09... THEN WHO MADE THE SIGHTING (1.31) SHOULD BE EQUAL TO 10 OR 05 OR 06.

ERROR112 IF THE FLIGHT # (1.04) IS 02 THRU 17 AND THE BOW OBSERVER (1.15) IS 06... THEN THE OTHER OBSERVERS (1.17, 1.19, 1.21) MUST EQUAL 100508.

ERROR113 IF THE FLIGHT # (1.04) IS 02 THRU 17 AND THE RECORDER (1.21) IS 08... THEN WHO MADE THE SIGHTING (1.31) SHOULD BE EQUAL TO 06 OR 10 OR 05.

ERROR114 IF THE FLIGHT # (1.04) IS 02 THRU 17 AND THE BOW OBSERVER (1.15) IS 04... THEN THE OTHER OBSERVERS (1.17, 1.19, 1.21) MUST EQUAL 080906.

ERROR115 IF THE FLIGHT # (1.04) IS 02 THRU 17 AND THE RECORDER (1.21) IS 06... THEN WHO MADE THE SIGHTING (1.31) SHOULD BE EQUAL TO 04 OR 08 OR 09.

ERROR116 IF THE FLIGHT # (1.04) IS 02 THRU 17 AND THE BOW OBSERVER (1.15) IS 09... THEN THE OTHER OBSERVERS (1.17, 1.19, 1.21) MUST EQUAL 040805.

ERROR117 IF THE FLIGHT # (1.04) IS 02 THRU 17 AND THE RECORDER (1.21) IS 05... THEN WHO MADE THE SIGHTING (1.31) SHOULD BE EQUAL TO 09 OR 04 OR 08.

ERROR118 IF THE FLIGHT # (1.04) IS 02 THRU 17 AND THE BOW OBSERVER (1.15) IS 08... THEN THE OTHER OBSERVERS (1.17, 1.19, 1.21) MUST EQUAL 090410.

ERROR119 IF THE FLIGHT # (1.04) IS 02 THRU 17 AND THE RECORDER (1.21) IS 10... THEN WHO MADE THE SIGHTING (1.31) SHOULD BE EQUAL TO 08 OR 09 OR 04.

ERROR120 IF THE FLIGHT # (1.04) IS 02 THRU 17 AND THE BOW OBSERVER (1.15) IS 05... THEN THE OTHER OBSERVERS (1.17, 1.19, 1.21) MUST EQUAL 061004.

ERROR121 IF THE FLIGHT # (1.04) IS 02 THRU 17 AND THE RECORDER (1.21) IS 04... THEN WHO MADE THE SIGHTING (1.31) SHOULD BE EQUAL TO 05 OR 06 OR 10.

ERROR122 IF THE FLIGHT # (1.04) IS 18 THRU 20 AND THE BOW OBSERVER (1.15) IS 10... THEN THE OTHER OBSERVERS (1.17, 1.19, 1.21) MUST EQUAL 041109.

ERROR123 IF THE FLIGHT # (1.04) IS 18 THRU 20 AND THE RECORDER (1.21) IS 09... THEN WHO MADE THE SIGHTING (1.31) SHOULD BE EQUAL TO 10 OR 04 OR 11.

ERROR124 IF THE FLIGHT # (1.04) IS 18 THRU 20 AND THE BOW OBSERVER (1.15) IS 06... THEN THE OTHER OBSERVERS (1.17, 1.19, 1.21) MUST EQUAL 090410.

ERROR125 IF THE FLIGHT # (1.04) IS 18 THRU 20 AND THE RECORDER (1.21) IS 10... THEN WHO MADE THE SIGHTING (1.31) SHOULD BE EQUAL TO 06 OR 09 OR 04.

ERROR126 IF THE FLIGHT # (1.04) IS 18 THRU 20 AND THE BOW OBSERVER (1.15) IS 11... THEN THE OTHER OBSERVERS

(1.17, 1.19, 1.21) MUST EQUAL 100906.

ERROR127 IF THE FLIGHT # (1.04) IS 18 THRU 20 AND THE RECORDER (1.21) IS 06... THEN WHO MADE THE SIGHTING (1.31) SHOULD BE EQUAL TO 11 OR 10 OR 09.

ERROR128 IF THE FLIGHT # (1.04) IS 18 THRU 20 AND THE BOW OBSERVER (1.15) IS 04... THEN THE OTHER OBSERVERS (1.17, 1.19, 1.21) MUST EQUAL 061011.

ERROR129 IF THE FLIGHT # (1.04) IS 18 THRU 20 AND THE RECORDER (1.21) IS 11... THEN WHO MADE THE SIGHTING (1.31) SHOULD BE EQUAL TO 04 OR 06 OR 10.

ERROR130 IF THE FLIGHT # (1.04) IS 18 THRU 20 AND THE BOW OBSERVER (1.15) IS 09... THEN THE OTHER OBSERVERS (1.17, 1.19, 1.21) MUST EQUAL 110604.

ERROR131 IF THE FLIGHT # (1.04) IS 18 THRU 20 AND THE RECORDER (1.21) IS 04... THEN WHO MADE THE SIGHTING (1.31) SHOULD BE EQUAL TO 09 OR 11 OR 06.

ERROR132 THE SIGHTING SHOULD NOT HAVE BEEN MADE BY THE RECORDER THEREFORE (1.31) MUST NOT EQUAL (1.21).

ERROR133 IF E1 OBS CODE (1.48) IS >0...THEN E1 BEST EST (1.50) OR E1 HIGHEST EST (1.54) OR E1 LOWEST EST (1.58) MUST BE GREATER THAN ZERO.

ERROR134 IF E2 OBS CODE (2.05) IS >0...THEN E2 BEST EST (2.07) OR E2 HIGHEST EST (2.11) OR E2 LOWEST EST (2.15) MUST BE GREATER THAN ZERO.

ERROR135 IF E3 OBS CODE (2.24) IS >0...THEN E3 BEST EST (2.30) OR E3 HIGHEST EST (2.26) OR E3 LOWEST EST (2.34) MUST BE GREATER THAN ZERO.

ERROR136 IF E4 OBS CODE (2.43) IS >0...THEN E4 BEST EST (2.49) OR E4 HIGHEST EST (2.45) OR E4 LOWEST EST (2.53) MUST BE GREATER THAN ZERO.

ERROR137 IF E5 OBS CODE (2.62) IS >0...THEN E5 BEST EST (2.68) OR E5 HIGHEST EST (2.64) OR E5 LOWEST EST (2.72) MUST BE GREATER THAN ZERO.

ERROR138 IF E6 OBS CODE (3.05) IS >0...THEN E6 BEST EST (3.11) OR E6 HIGHEST EST (3.07) OR E6 LOWEST EST (3.15) MUST BE GREATER THAN ZERO.

ERROR139 IF E1 BEST EST (1.50) OR E1 HIGHEST EST (1.54) OR

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           E1 LOWEST EST (1.58) IS >0... THEN E1 OBS CODE (1.48)
          MUST BE GREATER THAN ZERO.

ERROR140  IF E2 BEST EST (2.07) OR E2 HIGHEST EST (2.11) OR
           E2 LOWEST EST (2.15) IS >0... THEN E2 OBS CODE (2.05)
          MUST BE GREATER THAN ZERO.

ERROR141  IF E3 BEST EST (2.30) OR E3 HIGHEST EST (2.26) OR
           E3 LOWEST EST (2.34) IS >0... THEN E3 OBS CODE (2.24)
          MUST BE GREATER THAN ZERO.

ERROR142  IF E4 BEST EST (2.49) OR E4 HIGHEST EST (2.45) OR
           E4 LOWEST EST (2.53) IS >0... THEN E4 OBS CODE (2.43)
          MUST BE GREATER THAN ZERO.

ERROR143  IF E5 BEST EST (2.68) OR E5 HIGHEST EST (2.64) OR
           E5 LOWEST EST (2.72) IS >0... THEN E5 OBS CODE (2.62)
          MUST BE GREATER THAN ZERO.

ERROR144  IF E6 BEST EST (3.11) OR E6 HIGHEST EST (3.07) OR
           E6 LOWEST EST (3.15) IS >0... THEN E6 OBS CODE (3.05)
          MUST BE GREATER THAN ZERO.

ERROR145  IF E1 BEST EST AND E1 HIGHEST EST ARE NON-BLANK...THEN
             E1 BEST EST (1.50) MUST BE <= E1 HIGHEST EST (1.54)

ERROR146  IF E1 BEST EST AND E1 LOWEST EST ARE NON-BLANK ...THEN
             E1 BEST EST (1.50) MUST BE => E1 LOWEST EST (1.58).

ERROR147  IF E1 LOWEST EST AND E1 HIGHEST EST ARE NON-BLANK ...
          THEN E1 LOWEST EST (1.58) MUST BE <= E1 HIGHEST EST
          (1.54).

ERROR148  IF E2 BEST EST AND E2 HIGHEST EST ARE NON-BLANK...THEN
             E2 BEST EST (2.0 ) MUST BE <= E2 HIGHEST ESO ( 2311

ERROR149  IF E2 BEST EST AND E2 LOWEST EST ARE NON-BLANK ...THEN
             E2 BEST EST (2.07) MUST BE => E2 LOWEST EST (2.15).

ERROR150  IF E2 LOWEST EST AND E2 HIGHEST EST ARE NON-BLANK BHH
          THEN E2 LOWEST EST (2.15) MUST BE <= E2 HIGHEST EST
          (2.11).

ERROR151  IF E3 BEST EST AND E3 HIGHEST EST ARE NON-BLANK...THEN
             E3 BEST EST (2.26) MUST BE <= E3 HIGHEST EST (2.30)

ERROR152  IF E3 BEST EST AND E3 LOWEST EST ARE NON-BLANK ...THEN
             E3 BEST EST (2.26) MUST BE => E3 LOWEST EST (2.34).

ERROR153  IF E3 LOWEST EST AND E3 HIGHEST EST ARE NON-BLANK ...
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THEN E3 LOWEST EST (2.34) MUST BE <= E3 HIGHEST EST (2.30).

ERROR154 IF E4 BEST EST AND E4 HIGHEST EST ARE NON-BLANK...THEN E4 BEST EST (2.45) MUST BE <= E4 HIGHEST EST (2.49)

ERROR155 IF E4 BEST EST AND E4 LOWEST EST ARE NON-BLANK ...THEN E4 BEST EST (2.45) MUST BE => E4 LOWEST EST (2.53).

ERROR156 IF E4 LOWEST EST AND E4 HIGHEST EST ARE NON-BLANK ... THEN E4 LOWEST EST (2.53) MUST BE <= E4 HIGHEST EST (2.49).

ERROR157 IF E5 BEST EST AND E5 HIGHEST EST ARE NON-BLANK...THEN E5 BEST EST (2.64) MUST BE <= E5 HIGHEST EST (2.68)

ERROR158 IF E5 BEST EST AND E5 LOWEST EST ARE NON-BLANK ...THEN E5 BEST EST (2.64) MUST BE => E5 LOWEST EST (2.72).

ERROR159 IF E5 LOWEST EST AND E5 HIGHEST EST ARE NON-BLANK ... THEN E5 LOWEST EST (2.72) MUST BE <= E5 HIGHEST EST (2.68).

ERROR160 IF E6 BEST EST AND E6 HIGHEST EST ARE NON-BLANK...THEN E6 BEST EST (3.07) MUST BE <= E6 HIGHEST EST (3.11)

ERROR161 IF E6 BEST EST AND E6 LOWEST EST ARE NON-BLANK ...THEN E6 BEST EST (3.07) MUST BE => E6 LOWEST EST (3.15).

ERROR162 IF E6 LOWEST EST AND E6 HIGHEST EST ARE NON-BLANK ... THEN E6 LOWEST EST (3.15) MUST BE <= E6 HIGHEST EST (3.11).

ERROR163 IF % SPECIES 1 (1.62) >0, THEN SPECIES CODE 1 (1.65) MUST BE >0.

ERROR164 IF % SPECIES 2 (2.19) >0, THEN SPECIES CODE 2 (2.22) MUST BE >0.

ERROR165 IF % SPECIES 3 (2.38) >0, THEN SPECIES CODE 3 (2.41) MUST BE >0.

ERROR166 IF % SPECIES 4 (2.57) >0, THEN SPECIES CODE 4 (2.60) MUST BE >0.

ERROR167 IF % SPECIES 5 (2976) >0, THEN SPECIES CODE 5 (2.79) MUST BE >0.

ERROR168 IF SPECIES CODE 1 (1.65) >0, THEN % SPECIES 1 (1.62) MUST BE >0.

ERROR169 IF SPECIES CODE 2 (2.22) >0, THEN % SPECIES 2 (2.19) MUST BE >0.

ERROR170 IF SPECIES CODE 3 (2.41) >0, THEN % SPECIES 3 (2.38) MUST BE >0.

ERROR171 IF SPECIES CODE 4 (2.60) >0, THEN % SPECIES 4 (2.57) MUST BE >0.

ERROR172 IF SPECIES CODE 5 (2.79) >0, THEN % SPECIES 5 (2.76) MUST BE >0.

ERROR173 IF ANY OF THE FOLLOWING ARE NON-BLANK ... THEN THE SUM OF ALL OF THEM MUST BE EQUAL TO 100.
- % SPECIES 1 (1.62)
- % SPECIES 2 (2.19)
- % SPECIES 3 (2.38)
- % SPECIES 4 2.57)
- % SPECIES 5 (3.76)

ERROR174 AT LEAST ONE OF THE FOLLOWING MUST BE >0
- % SPECIES 1 (1.62)
- % SPECIES 2 (2.19)
- % SPECIES 3 (2.38)
- % SPECIES 4 (2.57)
- % SPECIES 5 (3.76)

ERROR301 IF THE CURRENT FLIGHT #(1.04) IS EQUAL TO THE PREVIOUS FLIGHT #(1.04)...THE CURRENT LEG #(1.06) MUST BE EQUAL TO THE PREVIOUS LEG # OR THE PREVIOUS LEG #

ERROR302 IF THE CURRENT FLIGHT #(1.04) IS EQUAL TO THE PREVIOUS FLIGHT #(1.04)...THE CURRENT DATE (1.08) MUST BE EQUAL TO THE PREVIOUS DATE.

ERROR303 IF THE CURRENT FLIGHT #(1.04) IS EQUAL TO THE PREVIOUS FLIGHT #(1.04)...THE CURRENT TIME (1.49-1.53) MUST BE GREATER THAN THE PREVIOUS TIME.

ERROR304 IF THE CURRENT FLIGHT #(1.04) IS EQUAL TO THE PREVIOUS FLIGHT #(1.04)...THE CURRENT LAT MINUTES (1.38-1.39) MUST BE WITHIN 20 MINUTES OF THE PREVIOUS LAT MINUTES.

ERROR305 IF THE CURRENT FLIGHT #(1.04) IS EQUAL TO THE PREVIOUS FLIGHT #(1.04)...THE CURRENT LONG MINUTES(1.45-1.46) MUST BE WITHIN 20 MINUTES OF THE PREVIOUS LONG MINUTES

ERROR306 IF THE CURRENT FLIGHT #(1.04) IS EQUAL TO THE PREVIOUS FLIGHT #(1.04)...THE CURRENT LAT DEG(1.36-1.37) MUST BE WITHIN 1 DEG OF THE PREVIOUS LAT DEG.

ERROR307 IF THE CURRENT FLIGHT #(1.04) IS EQUAL TO THE PREVIOUS FLIGHT #(1.04)...THE CURRENT LONG DEG(1942-1.44) MUST BE WITHIN 1 DEG OF THE PREVIOUS LONG DEG.

ERROR308 IF THE CURRENT FLIGHT #(1.04) IS EQUAL TO THE PREVIOUS FLIGHT #(1.04) AND THE CURRENT REASON FOR POSITION (1.54) IS EQUAL TO 1, 3, 5, OR 6,... THEN THE PREVIOUS REASON FOR POSITION MUST NOT EQUAL THE CURRENT REASON FOR POSITION.

ERROR309 IF THE CURRENT FLIGHT #(1.04) IS EQUAL TO THE PREVIOUS FLIGHT #(1.04) AND THE PREVIOUS REASON FOR POSITION (1.54) EQUALS 3 ... THEN THE CURRENT REASON FOR POSITION MUST EQUAL 4 OR 5.

ERROR310 IF THE CURRENT FLIGHT #(1.04) IS EQUAL TO THE PREVIOUS FLIGHT #(1.04) AND THE PREVIOUS REASON FOR POSITION (1.54) EQUALS 3 AND THE CURRENT REASON FOR POSITION IS 4... THEN THE PLANE MUST NOT BE SEARCHING ... (1.55) MUST EQUAL 2.